

WHAT IS CLAIMED IS

5 1. A smart card reader for receiving a smart card that has a vertical thickness and horizontally extending width and length said card having opposite faces and contact pads on an active one of said card faces, wherein the reader includes a frame device having a card-adjacent surface lying in a horizontal plane, and a plurality of contacts mounted on said frame device for engaging said contact pads when said card active face lies in a horizontal plane, a carriage device that is slideable in forward and rearward horizontal longitudinal directions on the frame device and that has a card pushing surface for partially ejecting a card, and a spring that urges the carriage device rearward, comprising:

10 a double click device that includes a largely planar cam-forming wall that has a recess forming a cam part, said double click device having a cam follower part engaged with the cam part, with one of said parts mounted on said frame device and the other mounted on said carriage device;

15 said largely planar cam-forming wall lies in a substantially vertical plane that is substantially normal to a lateral direction that is horizontal and perpendicular to said longitudinal directions, to thereby minimize the lateral width of the double click device.

2. The smart card reader described in claim 1 wherein:  
said cam-forming wall is fixed to said carriage to move with it;  
said cam follower part includes a first part that extends laterally into said recess that forms said cam, a second part that extends primarily forwardly from said first part, and a third part that extends laterally and that lies behind said recess and that is pivotally mounted on said housing.

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3. The smart card reader described in claim 1 wherein:

said cam-forming wall is fixed to said carriage to move with it;

said cam follower part includes a first part that extends laterally into said recess that forms said cam;

said card pushing surface is moveable between a rearward position, which said pushing surface occupies when no card is present, and a forward position which said pushing surface occupies when a card and said pushing surface lie in full forward positions;

at least a portion of said recess, and said first part of said cam follower, are directly laterally spaced from said card in its said card full forward position, to thereby reduce the longitudinal length of said reader.

4. The smart card reader described in claim 1 wherein:

said cam-forming wall is fixed to said carriage to move with it;

said cam follower part includes a first part that extends laterally into said recess that forms said cam, a second part that extends primarily forwardly from said first part, and a third part that extends laterally and that lies behind said recess and that is pivotally mounted on said housing;

said spring presses against said cam follower third part to provide limited friction against pivoting.

5. A smart card reader for receiving a smart card that has opposite faces and contact pads on one of said faces, wherein the reader includes a frame having a card-adjacent surface, and a plurality of contacts mounted on said frame and having pad-engaging ends extending above said card-adjacent surface, comprising:

a carriage that is slideable in forward and rearward longitudinal

directions on the frame, said carriage having a card push surface for partially ejecting a card;

a spring that urges the carriage rearward;

10 a double click device that latches said carriage in a forward working position after the carriage has, for the first time been moved forward to an overtravel position that is slightly forward of said working position, and that releases the carriage to be moved rearward by said spring to an initial position when the carriage is pushed forward to said overtravel position for the second  
15 time;

said carriage push surface lies above said card-engaging surface to enable a card front end to push said carriage forwardly, and said frame has a pair of stops that project above the level of said card-adjacent surface and that lie on either side of and even with said push surface in said overtravel position  
20 of said carriage.

6. The reader described in claim 5 wherein:

said double click device includes a cam part in a form of a recess and a cam follower part engaged with the cam part, with one of said parts mounted on said frame and the other mounted on said carriage, said cam follower part  
5 having a mount that is pivotally mounted about an axis that is perpendicular to said longitudinal directions, and said spring presses against said cam follower mount to provide an appreciable but limited friction against pivoting of the cam follower part.

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7. The reader described in claim 5 wherein:

said frame includes a main body with a rear portion that has laterally opposite sides, and a pair of laterally-spaced legs extending forwardly from each of said laterally opposite sides of said rear portion, said legs having front ends, said carriage lying between said legs and said legs forming guide walls that guide said carriage in longitudinal movement;

said frame includes a front body that has laterally opposite side portions that are each connected to a front end of one of said legs, said front body having a central cavity region;

said carriage being received in and being longitudinal slideable in said central cavity region; and including

said spring that biases said carriage rearwardly, lies at least partially in said central cavity region.

8. A smart card reader for receiving a smart card that has a card face with contact pads therein and that has front and rear opposite ends, comprising:

a frame that includes an upper card-adjacent face;

a carriage that is slideable in front and rear longitudinal directions on said frame, said carriage having an upstanding push wall for engaging an end of the smart card;

a plurality of contacts mounted on said frame and having pad engaging ends projecting above said card-adjacent face;

said frame includes a main body with a rear portion that has laterally opposite sides, and a pair of laterally-spaced legs extending forwardly from each of said laterally opposite sides of said rear portion, said legs having front ends, said carriage lying between said legs and said legs forming guide walls

that guide said carriage in longitudinal movement;

15           said frame includes a front body that has laterally opposite side portions that are each connected to a front end of one of said legs, said front body having a central cavity region;

          said carriage being received in and longitudinally slideable in said central cavity region; and including

20           a spring that biases said carriage rearwardly and that lies at least partially in said central cavity region.

9.       The reader described in claim 8 wherein:

          said spring is a helical spring;

          said carriage has a front portion with passage walls forming a passage with an open front end and with a longitudinally-extending open top gap and a longitudinally-extending open bottom gap, whereby to receive a spring of maximum diameter.

10.      The reader described in claim 8 wherein:

          said carriage has opposite sides that each has top and bottom flanges extending away from the flanges on the opposite side;

          said guiding walls of said legs form rails that each lies vertically between the top and bottom flanges on each side of the carriage.

11.      The reader described in claim 8 wherein:

          said carriage has an upstanding wall with a rear push surface lying above said upper card-adjacent face to abut the front end of a card;

          said frame includes a pair of upstanding stops with rearwardly-facing stop surfaces, said stops each lying on one of said legs, said carriage being

forwardly slideable to a carriage overtravel front position wherein said push surface lies between and even with said stop surfaces of said stops.

12. A smart card reader for receiving a smart card that has a face with contact pads thereon and that has front and rear ends, the reader having contacts for engaging the pads, comprising:

5 a frame that includes a rear body, said rear body having a rear part with laterally opposite sides and a pair of laterally-spaced legs extending forwardly from said opposite sides;

said frame includes a front body with laterally opposite sides fixed to said legs, said front body having a middle cavity portion that opens rearwardly;

10 a carriage that is slideably guided in front and rear movement between said legs, said carriage having a front portion that slides within said middle cavity portion, and said carriage front portion having a forwardly-opening spring passage;

a largely helical wire spring that has a rear portion lying in said spring passage and a front portion lying in said middle cavity portion.

13. The reader described in claim 12 wherein:

said front body has laterally opposite side cavities, and said legs have front ends lying in said side cavities.

14. The reader described in claim 12 wherein:

5 a double click mechanism including a cam formed on said carriage and a cam follower having a first part engaged with said cam, a second part extending from said first part, and a third part extending from second part, said third part lying in said middle cavity portion and pivotally mounted therein.

15. The reader described in claim 14 wherein:  
said third part lies between a front end of said spring and a wall of said front body, to provide friction against pivoting of said cam follower.

16. The reader described in claim 12 wherein:  
said rear body has a pair of wings at laterally opposite sides that each extends rearward from one of said legs;  
each wing has a smaller thickness than said legs.

17. The reader described in claim 16 including:  
a switch mounted on one of said legs, said switch constructed to sense full insertion of a card, said switch having a pair of electrical terminals lying under a first of said wings, and said first wing has a vertical hole lying directly over said terminals.

18. The reader described in claim 12 including:  
a switch for sensing card insertion, including a conductive blade fixed to said carriage and having a rear portion that lies over at least one of said contacts to alternately engage it and break engagement with it as said carriage moves.

19. A smart card reader for receiving a smart card that has opposite faces and contact pads on one of said faces, wherein the reader includes a frame device having a card-adjacent surface, and a plurality of contacts mounted on said frame device and having pad-engaging ends extending above said card-adjacent surface, a carriage device that is slideable in forward and rearward longitudinal directions on the frame device and that has a card pushing surface for partially ejecting a card, and a spring that urges the

carriage device rearward, comprising:

10 a double click device that includes a recess forming a cam part, said  
double click device having a cam follower part engaged with the cam part, with  
one of said parts mounted on said frame device and the other mounted on said  
carriage device, said cam follower part having a mount portion pivotally  
15 mounted about an axis that is perpendicular to said longitudinal directions, and  
said spring pressing said mount portion against the device on which said cam  
follower part is mounted to provide an appreciable but limited friction against  
pivoting of the mount portion.

20. The reader described in claim 19 wherein:

said cam part is formed by a recess in a first wall of said carriage;

5 said cam follower part is formed by an elongated member with two  
substantially 90° bends forming a first part that extends largely laterally and  
projects into the recess, a second part that forms said mount portion and that  
extends largely longitudinally and perpendicular to said first part, and a third  
part that forms said mount portion and that extends largely laterally and that is  
10 pivotally mounted on the frame device;

said spring includes a compression spring with one end that presses  
against said third part of said elongated member and that presses said third  
part against said frame.

21. The reader described in claim 20 wherein:

15 said cam follower third part has a slight bend of less than 30° that leaves  
a far end on one side of said slight bend, and said spring end presses on said  
far end to urge said elongated member to pivot about a vertical axis at said  
slight bend to urge said first part into said recess.



22. The reader describe in claim 19 including:

a circuit board with an upper face and conductive traces therein, said frame mounted on said board upper face;

said carriage device has a rear end and said frame forms a carriage-facing end wall with laterally opposite sides and with a middle, said middle of said carriage-facing end wall being spaced from said carriage rear end, to leave a space between them that is open vertically when said carriage lies in a rearward position, and said contacts have tails soldered to said circuit board traces at the bottom of said space.

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